# A Different Method Proposal To Improve Of Skills And Success Of The Subtraction At Primary Schools In Turkey

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## ABSTRACT
In this study 2nd grade primary school students' skills and success of subtraction especially with borrowing three digit numbers is investigated. Two different models of the subtraction are analyzed. One of them is used in Turkey (1) and the proposed method which is used in Austria (2). The present paper describes the success, both of the subtraction methods to be observed when 16 primary students worked on 10 subtraction problems. These 10 problems were administered repeatedly by means of a class test: In March 2015 firstly the standard Turkish algorithms were introduced and as a pretest examined, afterwards two weeks long two hours in a week Austrian system was practiced and finally they had been examined as a posttest with Austrian system.
**Keywords:** Mathematic teaching/learning, primary schools, basic mathematic operations, subtraction.

## INTRODUCTION
When considering the importance of the four basic operations in mathematics, the psychological studies focusing on subtraction solving are surprisingly scarce compared with those focusing on addition in the literature devoted to cognitive mental arithmetic. The rare studies focusing on subtraction in primary school children (Robinson, 2001) as well as in preschoolers (Siegler, 1987) have reported important individual variability in speed, accuracy, and strategy use. It has been assumed that such variability is comparable to that observed in addition. Nonetheless, the strategy of direct retrieval of the answer from memory, which is the fastest and most accurate strategy, seems to be used less frequently to solve subtractions than to solve additions (Robinson, 2001). The subtraction skill has an important place in learning mathematics which is required to acquire other high level objectives in the mathematics curriculum (Ozder, 2011).

Addition and subtraction are complementary operations. Knowledge of addition combinations has long been thought to facilitate the learning of subtraction combinations (e.g., 8 - 5 = ? can be answered by thinking 5 + ? = 8). Indeed, it follows from Siegler's (1987) model that an associative facilitating effect should make the correct answer the most common response to a subtraction combination, even in the earliest phase of mental-subtraction development.

Subtraction of multiunit numbers has the same three components as addition: (a) One operates on (subtracts) like multiunits, (b) this subtraction can be carried out as single-digit subtraction of the numbers of each kind of multiunit, and (c) trading is required for problems where the sum of a multiunit is ten or more. With addition, one can carry out the addition of like multiunits and only confront component (c), the problem of trading, if the sum exceeds nine. For subtraction, if a trade is necessary, one cannot even begin the subtraction of like multiunits until one has traded. Addition and subtraction are inverse (opposite) operations, and each multidigit addition problem is inversely related to two subtraction problems (those made by subtracting each addend from the sum). One will need to trade in a subtraction problem for any multiunit that was traded in the related inverse addition problem, because the number of that multiunit in the minuend (sum) will be less than the number of that multiunit in the subtrahend (addend being subtracted). Thus, trading in subtraction is just undoing the original trading that was required in addition, because one could not write the whole two-digits um for that multiunit. Therefore, trading in subtraction is just one-for-ten trading to the right, the opposite of the ten-for-one trading to the left that occurs for addition (Fuson, 1990).

Resnick (1992) noted that, starting at about 7 years old, children begin to use a choice strategy: choose between two informal computational strategies to determine differences. In cases in which the numbers are relatively close, such as 7 - 5, counting down ("7; 6 [is one less], 5 [is 2 less], 4 [is 3 less], 3 [is 4 less], 2 [is 5 less]-so the answer is 2") is

more difficult to execute than counting up ("5; 6 [is 1 more], 7 [is 2 more]-so the answer is 2"); therefore, children tend to choose the latter strategy.

The above examples demonstrate that subtraction mistakes are caused by defects in the students' prerequisite behavioral objectives. Here the learning defect is due to not knowing the decomposition principle incorrectly. Therefore, while teaching subtraction pre- and post-aspects of the behavioral objectives must be known for effective teaching (Ozder, 2011). Different methods for teaching behavioral objectives related to subtraction skills including the principle of equality and change in decimal-hundred fractions where students make most of their mistakes can be tested (Haylock, 2005).

**METHODOLOGY**

**Research Design:** If the digits of the top number (subtrahend) are greater than the digits of the lower number (minuend), then everything is very simple, for example:

$$\begin{array}{r} 974 \\ -\ 851 \\ \hline 123 \end{array}$$

For this calculation in (1) we say: 4 minus 1 is 3, 7 minus 5 is 2 and 9 minus 8 is 1. In (2) is used supplementary method and we say: 1 and 3 is 4, 5 and 2 is 7 and 8 and 1 is 9.

But if the digits of the minuend are greater than the digits of the subtrahend, then everything is quite terrible, for example:

$$\begin{array}{r} 672 \\ -\ 298 \\ \hline ??? \end{array}$$

In subtraction method (1) are the children are confused with drawing lines and calculate as:

$$\begin{array}{rccc} & & {\scriptstyle 16} & \\ & {\scriptstyle 5} & {\scriptstyle \cancel{6}} & {\scriptstyle 12} \\ & \cancel{6} & \cancel{7} & \cancel{2} \\ - & 2 & 9 & 8 \\ \hline & 3 & 7 & 4 \end{array}$$

2 less 8 is not possible, therefore we take from the 7 tens of subtrahend one ten, must deduct from 7 - 1 and it remains 6 tens, so have 10 + 2 = 12 one count available and can now calculate 12 - 8 = 4. And by the second step also 6 less 9 is not possible, therefore we take from the 6 hundred of subtrahend one hundred, that is 10 tens must deduct from 5 - 1 and it remains 5 hundred, so have 10 + 6 = 16 tens available and can now calculate 16 - 9 = 7. And finally 5 - 2 = 3. So as a result, 12 minus 8 is **4**, 16 minus 9 is **7**, 5 minus 2 is **3**. That is **374**.

This calculation could be done with proposed method (2) as follows:

$$\begin{array}{r} 6\ 7\ 2 \\ -\ 2_1 9_1 8 \\ \hline 3\ 7\ 4 \end{array}$$

8 plus how much is 2, is not possible, therefore it is called 8 plus how much is 12; **4**. So that it is remembered with a small 1 in addition to the 9 by minuend that later also actually by 1 more respectively have to deduct not only 9 but 9 + 1 = 10. 10 plus how much is 7, is not possible, therefore it is called 10 plus how much is 17; **7**. So that it is remembered with a small 1 in addition to the 2 by minuend that later also actually by 1 more respectively have to deduct not only 2 but 2 + 1 = 3. Finally, 3 plus how much is 6; **3**. So as a result, **4** and 8 is 12, **7** and 10 (9 + 1) is 17, **3** and 3 (2 + 1) is 6. That is **374**.

**Purpose of Study:**

The purpose of this study is to determine the skills and the success of the objectives belonging to the multi digit subtraction with borrowing in the 2nd grade mathematics curriculum of two different methods.

**Study Group:**
The study was conducted with 2nd grade primary school students at Atatürk Primary School in Kaynarca, Sakarya during the 2014-2015 academic year. There were 16 students in total.
**Procedure:**
To examine the main purpose, the following research sub questions were asked:

- How are the skills and success in 2nd grade primary school students in three-digit number subtraction before the proposed method?
- Whether the skills and success in 2nd grade primary school students have developed in three-digit subtraction after teaching the proposed method?

For this purpose, considered hypotheses are chosen as follows:

**$H_0$:** There is not the statistically significant average success difference between both methods.
**$H_1$:** There is the statistically significant average success difference between both methods.

**Research Instruments:**
Research was conducted with 16 students in 2c class at Atatürk Primary School in Kaynarca, Sakarya and was prepared according to the pretest-posttest model. During the research, the operations below were performed successively.

- All of 16 children were administered a formative test (as a pretest) with following 10 questions:

| Q1) | Q2) | Q3) | Q4) | Q5) |
|---|---|---|---|---|
| $\begin{array}{r} 783 \\ -\ 248 \\ \hline \end{array}$ | $\begin{array}{r} 615 \\ -\ 494 \\ \hline \end{array}$ | $\begin{array}{r} 921 \\ -\ 567 \\ \hline \end{array}$ | $\begin{array}{r} 512 \\ -\ 199 \\ \hline \end{array}$ | $\begin{array}{r} 1000 \\ -\ 328 \\ \hline \end{array}$ |
| **Q6)** | **Q7)** | **Q8)** | **Q9)** | **Q10)** |
| $\begin{array}{r} 403 \\ -\ 154 \\ \hline \end{array}$ | $\begin{array}{r} 854 \\ -\ 798 \\ \hline \end{array}$ | $\begin{array}{r} 746 \\ -\ 248 \\ \hline \end{array}$ | $\begin{array}{r} 680 \\ -\ 334 \\ \hline \end{array}$ | $\begin{array}{r} 921 \\ -\ 145 \\ \hline \end{array}$ |

- 2 weeks with 2 hours in a week teaching were held in the class. Firstly, the proposal method was presented. And then many examples were solved with the participation of students.
- After 2 weeks teaching same questions in pretest were asked again (as a posttest).

**Data Analyses:**
After collecting the pretest and posttest data, were saved to computer and arranged. After the reliability and validity values of the scales were determined, the phase of data analysis started.
The determination of descriptive statistics for the analysis of data; paired samples t test ($p < .005$) were applied. Excel and SPSS software was used for the data analysis.
**Finding and Results:**
The posttest data from subtraction timed test served to check whether knowledge of addition combinations plays a key role in mastering subtraction combinations. Following Figure 1 show us how well the children have been involved in a short time and have shown success. For example:

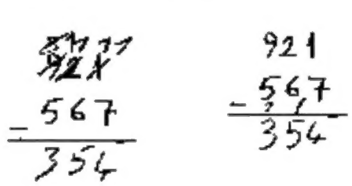

*Figure 1.* Q3 with both of methods

Question 5 was purposely chosen to look at how the children react. By pretest were all of children confused but by posttest 3 of 16 could answer it true (see Figure 2 and Table 1). One of the children has written under the line: "I have not understood and could not made"

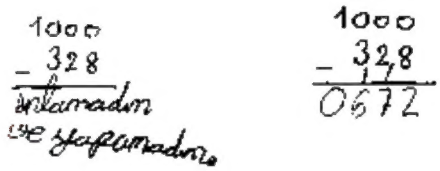

*Figure 2.* Q5 in pre- and posttest

By pretest, 1 of 16 children answered Q6 correct but by posttest 9 of 16 have been able to create (Figure 3).

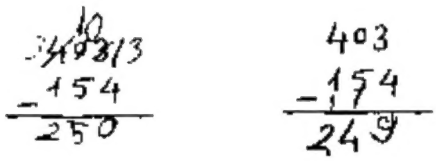

*Figure 3.* Q6 in pre- and posttest

Below the examples are given from some of asked questions which from children were answered in the pre- and posttest (Figure 4).

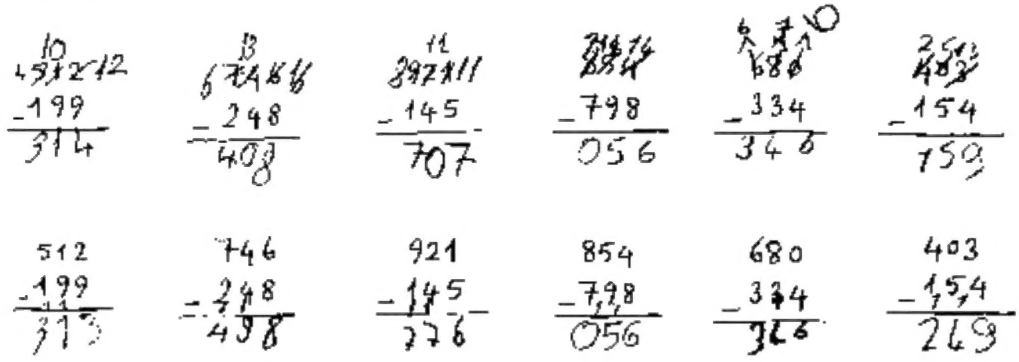

*Figure 4.* Some examples from pre- and posttest

This method provides a positive effect on the students to be understood subtraction easily. Furthermore, the method is for the primary school teachers seems assisting them for the subtraction more comfortable describe and explain.

**Table 1**
Pretest – Posttest Result

| Children | Results of the tests: true (T) or false (F) in | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Pretest with questions number (Q)* | | | | | | | | | | *Posttest with questions number (Q)* | | | | | | | | | |
| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
| 1 | T | F | F | T | F | F | F | F | F | F | T | F | F | T | F | T | F | T | F | F |
| 2 | T | T | T | T | F | F | F | F | T | F | T | T | T | F | F | T | T | T | T | T |
| 3 | T | T | F | F | F | F | F | F | T | F | F | T | F | F | F | T | T | F | F | T |
| 4 | T | T | F | F | F | F | F | F | T | F | T | T | F | F | F | T | T | F | T | T |
| 5 | T | F | F | T | F | F | T | T | T | F | T | T | T | F | F | T | T | T | T | F |
| 6 | T | F | F | F | F | F | F | F | T | F | T | T | F | F | F | F | F | F | T | F |
| 7 | T | F | F | F | F | F | F | F | T | F | T | F | F | F | F | F | F | F | T | T |
| 8 | T | T | T | T | F | F | T | T | F | T | T | T | T | F | T | T | T | T | T | T |
| 9 | T | F | F | F | F | T | F | F | T | F | T | T | F | F | F | T | F | F | T | T |
| 10 | T | T | T | T | F | F | T | T | T | T | T | T | T | T | T | F | T | T | T | T |
| 11 | T | T | T | T | F | F | F | T | T | T | T | T | T | T | F | F | F | T | T | F |
| 12 | T | T | T | T | F | F | T | F | T | T | T | T | T | F | T | F | F | F | T | T |
| 13 | T | T | T | F | F | F | T | T | F | T | T | T | T | F | F | T | T | F | T | T |
| 14 | T | T | F | F | F | F | T | T | T | T | T | T | T | T | F | F | T | T | T | F |
| 15 | T | T | T | F | F | F | F | T | F | F | T | T | T | F | F | T | F | F | T | F |
| 16 | T | T | F | F | F | F | T | F | T | T | T | T | T | F | F | F | F | F | F | T |

For the pretest given true response rates of the students is 47% and posttest is 58%, thus is observed with the proposed method in a short time the increase of the level of success 23%.

In the following tables (Table 2 and Table 3) are presented if there is a statistically significant difference between the dependent groups (paired sample) t-test results between pretest and posttest.

**Table 2**
Paired Sample Statistics

| | *M* | *N* | *Std. Deviation* | *Std. Error Mean* |
|---|---|---|---|---|
| Austrian method | 5,8125 | 16 | 1,93972 | ,48493 |
| Turkish method | 4,6875 | 16 | 2,02382 | ,50595 |

**Table 3**
Paired Sample t test

| | Paired Differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 95% Confidence Interval of the Difference | | | | |
| | Mean | Std. Dev. | Std. Err. M. | Lower | Upper | t | df | Sig. (2-tailed) |
| Austrian and Turkish method | 1,12500 | 1,25831 | ,31458 | ,45450 | 1,79550 | 3,576 | 15 | ,003 |

The paired sample t-test table (Table 3) reveals that there is the significantly scores difference between by pretest used Turkish method and by posttest used Austrian method ($p <.005$). It determined that the difference is in favor of the posttest and $\mathbf{H_1}$ hypothesis was accepted. In this case, Austrian subtraction method for the students can be expressed as a positive effect on skills and success.

## CONCLUSIONS

Especially in this study was used second method because of the subtraction difficulties for students. After short practice sessions was seen this method is more understandable for the children. Moreover, increases the skills and the

success of the children in a short time. So second method seems to be better and uncomplicated and could be overcome the difficulties of subtraction understanding in mathematics.

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